

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-339357

(43)Date of publication of application : 27.11.2002

(51)Int.Cl.

E02D 5/80

E21D 20/00

(21)Application number : 2001-144256

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(22)Date of filing : 15.05.2001

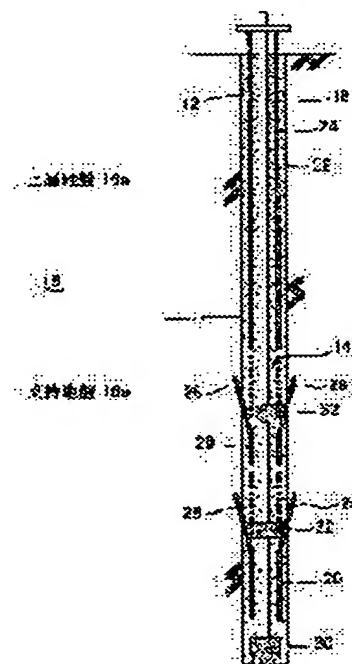
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## (54) STRUCTURE FOR INCREASING BEARING CAPACITY OF BEARING BODY BURIED IN GROUND AND CONSTRUCTION METHOD FOR ABOVE BEARING BODY

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent a huge reduction in bearing capacity after action of an external force.

**SOLUTION:** The bearing body 10 is provided with a reinforcing material 4, which has a reinforcing pipe 20 and a reinforcing rod 22, and a curable grout material 18 which makes the reinforcing material 14 anchored to ground 16. In the reinforcing pipe 20, a notched part is formed in a position facing a side surface, in order to form a blade part 28. A wedge 32 is fixed on a lower side of the rod 22. After being installed with the reinforcing pipe 20 in a drilled hole 12, the rod 22 is moved to a lower side of the drilled hole 12 by an urge from a jack, etc. When the rod 22 is moved to a lower side in a direction of depth, the wedge 32 intrudes into each of the reinforcing pipes 20 from an upper end side thereof, so that the blade part 28 can be protruded outward from the side surface of the reinforcing pipe 20. A part, on an upper end side, of the blade part 28 digs into the ground 16 in such a manner as to push in a side wall of the drilled hole 12 outward.



### LEGAL STATUS

[Date of request for examination]

09.06.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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**CLAIMS**

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[Claim(s)]

[Claim 1] In the foundation laying-under-the-ground base material equipped with the reinforcing materials by whom insertion installation is done into drilling excavated all over the foundation, and the hardenability grout material with which it fills up in said drilling and which is established in said reinforcing materials said reinforcing materials The bearing capacity enhancer of the foundation base material characterized by having had hollow tubed reinforcement tubing and the reinforcement rod by which insertion immobilization is carried out into this reinforcement tubing, having projected to the method of outside on the side face of said reinforcement tubing, and preparing the wing section to which that part eats into the foundation.

[Claim 2] Said wing section is the bearing capacity enhancer of the foundation base material according to claim 1 characterized by forming in a reverse Ha typeface so that one pair may be prepared so that said reinforcing materials's side face may be countered, and mutual spacing may contract towards the lower part side of the depth direction of said drilling.

[Claim 3] Said wing section is the bearing capacity enhancer of the foundation base material according to claim 1 or 2 characterized by separating predetermined spacing and arranging in the shape of a stage along the depth direction of said drilling.

[Claim 4] The construction approach of the foundation laying-under-the-ground base material characterized by to carry out the insertion installation of the reinforcing materials into drilling excavated all over the foundation, to make the wing section prepared for said reinforcing materials installed in said drilling before being filled up with said grout material in the construction approach of the foundation laying-under-the-ground base material filled up with the hardenability grout material established in said reinforcing materials in said drilling project to the method of outside, and to make the part eat into the foundation.

[Claim 5] Said reinforcing materials have hollow tubed reinforcement tubing and the reinforcement rod by which insertion immobilization is carried out into this reinforcement tubing. Prepare notching of the pair of an abbreviation U typeface in the opposite location of the side face of said reinforcement tubing, and it considers as said wing section. The construction approach of the foundation laying-under-the-ground base material according to claim 4 which is made to move the reinforcement rod which carried out insertion installation into said reinforcement tubing in the depth direction, is made to carry out press fit immobilization of the wedge with which the reinforcement rod concerned is equipped at the inside side of said wing section, and is characterized by make said wing section project from the side face of said reinforcement tubing to the method of outside.

[Claim 6] Said reinforcement rod is the construction approach of the foundation laying-under-the-ground base material according to claim 5 characterized by having the tip supporter pressed fit at the tip all over the foundation.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the construction approach of the increment structure in bearing capacity of a foundation laying-under-the-ground base material, and this base material.

[0002]

[Description of the Prior Art] The ground anchor is known as a base material used for an alternative of OFF and the strut timbering in stabilization support of an embankment slope, or temporary earth retaining wall construction. This kind of ground anchor excavates the foundation with a boring machine, forms drilling, after it inserts the reinforcing materials who consist of reinforcement, reinforcing bars, etc. in drilling, is filled up with the grout material of hardenability in drilling, and fixes reinforcing materials in drilling.

[0003] Grout material is usually performed at two processes of primary impregnation and the secondary grout performed after that, and a secondary grout applies a pressure to grout material, and is pressurization impregnation for making it spread all over the foundation.

[0004] However, when you were going to make it increase the frictional resistance lateral friction side friction skin friction (bearing capacity) of the ground anchor constructed by such method of construction, the technical technical problem explained below occurred.

[0005]

[Problem(s) to be Solved by the Invention] That is, although the secondary grout by pressurization serves as indispensable requirements by the conventional method of construction in making the frictional resistance lateral friction side friction skin friction of a ground anchor increase, a casing packer will be used in order to centralize a pressure, in case the secondary grout by pressurization is carried out.

[0006] however — even if it makes a casing packer expand — the foundation — the variation rate was in the magnitude of a gap according to description, and in order to make fixed frictional force increase in the condition of having been stabilized, there was a problem that management of welding pressure and management of an injection rate became difficult.

[0007] Moreover, when pressurization performed the secondary grout, external force, such as an earthquake, acts, although the frictional resistance lateral friction side friction skin friction after impregnation improves and friction goes out, subsequent bearing capacity has the danger of falling more greatly than the first stage.

[0008] The troublesome management of grout of the place which this invention is made in view of such a conventional trouble, and is made into the purpose is unnecessary, and it is to offer the construction approach of the increment structure in bearing capacity of a foundation laying-under-the-ground base material without the sharp fall of the frictional resistance lateral friction side friction skin friction (bearing capacity) after external force, such as an earthquake, acts, and this base material.

[0009]

[Means for Solving the Problem] In the foundation laying-under-the-ground base material equipped with the reinforcing materials by whom insertion installation is done into drilling which

excavated this invention all over the foundation, and the hardenability grout material with which it fills up in said drilling, and which is established in said reinforcing materials in order to attain the above-mentioned purpose Said reinforcing materials had hollow tubed reinforcement tubing and the reinforcement rod by which insertion immobilization is carried out into this reinforcement tubing, projected to the method of outside on the side face of said reinforcement tubing, and prepared the wing section to which that part eats into the foundation.

[0010] Thus, since the wing section to which it projects to the method of outside on the side face of reinforcement tubing, and the part eats into the foundation is prepared according to the bearing capacity enhancer of the constituted foundation base material, the bearing capacity which contains the frictional resistance lateral friction side friction skin friction of a foundation laying-under-the-ground base material by the wing section which ate into the foundation improves.

[0011] Since the increment in such bearing capacity does not fall if the wing section deforms greatly and does not secede from the foundation which is eating away even when seismic force is added, there are very few falls of the bearing capacity after an earthquake.

[0012] One pair of said wing section is prepared so that the side face of said reinforcement tubing may be countered, and it can be formed in a reverse Ha typeface so that mutual spacing may contract towards the lower part side of the depth direction of said drilling.

[0013] According to this configuration, reinforcing materials's drawing resistance also becomes large.

[0014] Along the depth direction of said drilling, said wing section can separate predetermined spacing and can arrange it in the shape of a stage.

[0015] According to this configuration, according to the increment in the number of stages of the wing section, the bearing capacity of a foundation laying-under-the-ground base material can be raised further.

[0016] Moreover, this invention carried out insertion installation of the reinforcing materials into drilling excavated all over the foundation, and before it was filled up with said grout material in the construction approach of the foundation laying-under-the-ground base material filled up with the hardenability grout material established in said reinforcing materials in said drilling, it makes the wing section prepared for said reinforcing materials installed in said drilling project to the method of outside, and it was made make the part eat into the foundation.

[0017] Thus, since according to the construction approach of the constituted foundation laying-under-the-ground base material the wing section prepared for the reinforcing materials installed in drilling is made to project to the method of outside and the part is made to eat into the foundation, the bearing capacity of a foundation laying-under-the-ground base material improves by the wing section which ate into the foundation.

[0018] Such improvement effectiveness of bearing capacity can be done so, without performing the secondary grout of grout material, and management of a troublesome pressure or an injection rate becomes unnecessary.

[0019] Said reinforcing materials have hollow tubed reinforcement tubing and the reinforcement rod by which insertion immobilization is carried out into this reinforcement tubing. Prepare notching of the pair of an abbreviation U typeface in the opposite location of the side face of said reinforcement tubing, and it considers as said wing section. The reinforcement rod which carried out insertion installation into said reinforcement tubing can be moved in the depth direction, press fit immobilization of the wedge with which the reinforcement rod concerned is equipped can be carried out at the inside side of said wing section, and said wing section can be made to project from the side face of said reinforcement tubing to the method of outside.

[0020] Said reinforcement rod can form the tip supporter pressed fit all over the foundation at the tip.

[0021] According to this configuration, if a tip supporter is pressed fit all over the tip foundation, the pressure bulb by which the consolidation of the foundation earth and sand was carried out to this part will be formed, and the tip support engine performance will improve.

[0022]

[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is

explained to a detail based on an accompanying drawing. Drawing 5 shows the increment structure in bearing capacity of the foundation laying-under-the-ground base material concerning this invention, and one example of the construction approach of this base material from drawing 1 .

[0023] The foundation laying-under-the-ground base material 10 of this example is equipped with the reinforcing materials 14 by whom insertion installation is done into the drilling 12 which excavated the whole time configuration of the completion all over the foundation as shown in drawing 4 , and the hardenability grout material 18 with which it fills up in drilling 12 and which is fixed to the foundation 16 in reinforcing materials 14.

[0024] In the case of this example, reinforcing materials 14 consist of hollow tubed reinforcement tubing 20, a reinforcement rod 22 by which insertion immobilization is carried out into this reinforcement tubing 20, and a hollow tubed reinforcement steel pipe 24 in which both ends carried out opening.

[0025] The reinforcement tubing 20 is the hollow shell of the predetermined die length in which the vertical edge formed so that a lower part might become taper-like as the detail was shown in drawing 5 carried out opening, and the wing section 28 of the pair which counters is formed in the opposite location of a side face by carrying out pair formation of the slit-like notch 26 of an abbreviation U form beforehand.

[0026] In the case of this example, such reinforcement tubing 20 separates predetermined spacing in the vertical direction to the lower limit side of the depth direction of drilling 12, and two pieces are installed in the shape of a stage. In addition, although the overall length of the reinforcement tubing 20 by the side of the lower berth is longer than the reinforcement tubing 20 by the side of an upper case in the example shown in drawing 4 , if the die length of the wing section 28 is the same, the function is substantially the same [ these of that of the same die length are also good, and ].

[0027] It consists of the reinforcement or reinforcing bars of drilling 12 longer than digging length, and, as for the reinforcement rod 22, the tip supporter 30 pressed fit at a tip all over the foundation is fixed. This tip supporter 30 is formed in the shape of [ minor diameter / bore / of the shape of a taper of the reinforcement tubing 20 / tip ] a truncated cone.

[0028] This tip supporter 30 is in the condition that that tip was contacted by the lower limit side of drilling 12, is applying the energization force of going caudad from the upper limit side of the reinforcement rod 22, and is pressed fit all over the tip foundation of drilling 12.

[0029] Moreover, in the vertical direction, the wedge 32 of a pair separates predetermined spacing and is fixed to the lower part side of the reinforcement rod 22. That installation spacing is set up so that this wedge 32 may be located in the upper part side of each reinforcement tubing 20.

[0030] The wedge 32 is equipped with body 32a which has the diameter of a taper which can be inserted in the interior from the upper limit side of the reinforcement tubing 20, and taper-like projection 32b of the pair which protruded on the side-face opposite location of body 32a as the detail is shown in drawing 5 .

[0031] The installation location of taper-like projection 32b of this pair is equivalent to the location of the wing section 28 prepared by forming a notch 26 in the reinforcement tubing 20. Moreover, two or more through tube 32c which penetrates this up and down is prepared in body 32a of a wedge 32, and the circulation by the side of the lower part of the grout material 18 poured in into drilling 12 is attained.

[0032] The reinforcement rod 22 with which such the tip supporter 30 and a wedge 32 were formed is installed with the reinforcement tubing 20 in drilling 12, and is moved for the reinforcement rod 22 to the lower part side of drilling 12 by energization force, such as a jack, after that.

[0033] If the reinforcement rod 22 is moved to the lower part side of the depth direction of drilling 12, in case a wedge 32 will trespass upon the interior from the upper limit side of each reinforcement tubing 20 and a wedge 32 will invade, while projection 32b of each wedge 32 contacts the inside of the wing section 28, it moves to a lower part side.

[0034] In this case, if taper-like projection 32b moves to a lower part side while this contacts

the inside of the wing section 28 since it is projected to the method of outside from body 32a which has the diameter of a taper which can be inserted in the interior of the reinforcement tubing 20, the wing section 28 projects in the method of outside from the side face of the reinforcement tubing 20 with this migration.

[0035] Thus, as a part stuffs the side attachment wall of drilling 12 outside, it will eat into the upper limit side of the wing section 28 projected to the method of outside on the side-attachment-wall foundation of drilling 12. Since one pair is prepared so that the wing section 28 may counter the side face of the reinforcement tubing 20 in the case of this example, if these are made to project to the method of outside, it will be formed in a reverse Ha typeface so that mutual spacing may contract towards the lower part side of the depth direction of drilling 12.

[0036] If the wing section 28 is constituted in such the condition, reinforcing materials's 14 drawing resistance will also become large. If the wing section 28 is made to project to the hardenability grout material 18 by the method of outside, impregnation restoration will be carried out into drilling 12, and it will fix reinforcing materials 14 in drilling 12 by hardening.

[0037] In addition, in the case of this example, although the case where the reinforcement steel pipe 24 is installed in drilling 12 as it straddled between the upper limit of bearing-stratum 16b of that lower part from upper foundation 16a is illustrated, this reinforcement steel pipe 24 is not necessarily needed.

[0038] Now, since the wing section 28 to which it projects to the method of outside on the side face of the reinforcement tubing 20, and the part eats into the foundation 16 is formed according to the foundation laying-under-the-ground base material 10 constituted as mentioned above, the bearing capacity of the foundation laying-under-the-ground base material 10 improves by the wing section 28 which ate into the foundation 16.

[0039] Since it does not fall if the wing section 28 does not deform the increment in such bearing capacity greatly even when seismic force is added, there are very few falls after an earthquake.

[0040] Moreover, in this example, since the wing section 28 separated predetermined spacing and arranges it in the shape of a stage along the depth direction of drilling 12, according to the increment in the number of stages of the wing section 28, the bearing capacity of the foundation laying-under-the-ground base material 10 can be raised further, and adjustment of the bearing capacity to which it is made to increase is also attained.

[0041] Next, the construction approach of the foundation laying-under-the-ground base material 10 of the above-mentioned configuration is explained. In case the foundation laying-under-the-ground base material 10 is built, as shown in drawing 1 , digging formation of the drilling 12 is first carried out all over the foundation 16.

[0042] In case drilling 12 is excavated, casing is inserted into drilling 12 if needed, and drilling 12 penetrates upper foundation 16a, and is formed to the predetermined depth of bearing-stratum 16b of the lower part.

[0043] When digging formation of such drilling 12 was carried out and casing is used, this is removed, and as shown in drawing 2 , insertion installation of the reinforcing materials 14 is carried out into drilling 12. The reinforcing materials 14 of this example consist of two reinforcement tubing 20, the tip supporters 30 and the reinforcement rods 22 with which the wedge 32 of a pair was formed, and reinforcement steel pipes 20.

[0044] In case reinforcing materials 14 are inserted into drilling 12, before equipping the reinforcement rod 22 with a wedge 32, the reinforcement tubing 20 by the side of the lower berth is first inserted in the periphery of the reinforcement rod 22, and fitting of the upper part side of the tip supporter 30 is carried out to the tip side.

[0045] Next, the reinforcement rod 22 is equipped with the wedge 32 by the side of the lower berth, and as a part of tip of a wedge 32 fits in in the upper limit of the reinforcement tubing 20, it positions the vertical direction, and it fixes a wedge 32 to the location.

[0046] In case a wedge 32 is fixed, positioning of a hoop direction is also performed so that projection 32b may contact the inside of the wing section 28 of the reinforcement tubing 20. Next, the reinforcement tubing 20 by the side of an upper case is installed in the upper part of the wedge 32 by the side of the lower berth, the upper part is equipped with a wedge 32, it

positions to the upper and lower sides and a hoop direction, and this is fixed to the reinforcement rod 22.

[0047] If the reinforcement tubing 20 separates spacing in the vertical direction and is attached in it, the reinforcement rod 22 will be built by drilling 12 and insertion installation of the reinforcement steel pipe 24 will be carried out into drilling 12 after that. In addition, the installation condition of the reinforcement tubing 20 may be in the condition which could combine by welding what has been arranged up and down, was made to carry out fitting association mutually, or further only carried out the laminating to it up and down.

[0048] After installation of reinforcing materials 14 is completed in the condition which shows in drawing 2 next, as shown in drawing 3 , a jack 34 is installed in the ground side protrusion edge of the reinforcement rod 22 through a bearing plate 33.

[0049] A jack 34 turns and moves the reinforcement rod 22 to the lower part side of the depth direction of drilling 12. If the reinforcement rod 22 is moved in such a direction, the tip supporter 30 formed in the lower limit will be first pressed fit all over the tip side foundation of drilling 12 in response to the energization force of a jack 34.

[0050] If the tip supporter 30 does in this way and is pressed fit all over the foundation, the consolidation of the circumference foundation will be carried out, the pressure bulb A as shown in drawing 3 by the dotted line will be formed, and the tip support engine performance of the foundation laying-under-the-ground base material 10 which this builds will improve.

[0051] Moreover, if it can come, simultaneously the reinforcement rod 22 is turned and moved to the lower part side of the depth direction of drilling 12, since the wedge 32 is located in the upper part side of each reinforcement tubing 20, projection 32b of a wedge 32 is pressed fit in the inside side of the wing section 28 of the reinforcement tubing 20 with migration of a rod 22.

[0052] if projection 32b is pressed fit in the inner circumference side of the wing section 28, since the wing section 28 is separated from the side face of the reinforcement tubing 20 by the notch 26 — lower part migration of a wedge 32 — \*\* — it will be maintained by the condition if breadth and a wedge 32 are pressed fit into the reinforcement tubing 20 as it becomes and the upper limit side estranges from the side face of the reinforcement tubing 20, and fixed by the position.

[0053] Since one pair of wing section 28 is formed in the opposite location of the side face of the reinforcement tubing 20 at this time, when this spreads by press fit of a wedge 32 in the case of this example, as it is shown in drawing 3 , it is formed in a reverse Ha typeface which mutual spacing reduces towards the lower part side of the depth direction of drilling 12.

[0054] Thus, when the wing section 28 is made to project from the side face of the reinforcement tubing 20 to the method of outside, as the part by the side of the tip stuffs the side attachment wall of drilling 12 outside, it will eat into the foundation.

[0055] After pushing actuation of such reinforcing materials 14 is completed, the reinforcement steel pipe 24 is pulled up up if needed, after that, as the energization force of a jack 34 is opened wide and it is shown in drawing 4 , if impregnation restoration of the grout material 18 is carried out into drilling 12 and the grout material 18 hardens, the predetermined foundation laying-under-the-ground base material 10 will be built, and such a base material 10 will be used as an auxiliary pile of a ground anchor or the structure. In addition, the reinforcement steel pipe 24 may be made to save in the condition as it is, without pulling up up.

[0056] Now, since according to the construction approach of the base material 10 constituted as mentioned above the wing section 28 prepared for the reinforcing materials 14 installed in drilling 12 is made to project to the method of outside and the part is made to eat into the foundation 16, the bearing capacity of the foundation laying-under-the-ground base material 10 improves by the wing section 28 which ate into the foundation 16.

[0057] Such improvement effectiveness of bearing capacity can be done so, without performing the secondary grout of the grout material 18, and management of a troublesome pressure or an injection rate becomes unnecessary.

[0058] In addition, although the case where the two-step laminating of the reinforcement tubing 20 which formed the wing section 28 was carried out in the vertical direction was illustrated in the above-mentioned example, operation of this invention is not limited to this, for example, one



step is available for it, and it may carry out a laminating to three or more steps.

[0059] Moreover, although the case where the wing section 28 of the pair which counters the reinforcement tubing 20 was formed was illustrated in the above-mentioned example, operation of this invention is not limited to this, for example, may be prepared three sheets at intervals of 120 degrees.

[0060]

[Effect of the Invention] As mentioned above, as explained to the detail, according to the construction approach of the increment structure in bearing capacity of the foundation laying-under-the-ground base material concerning this invention, and this base material, troublesome management of grout is unnecessary and there is no sharp fall of the bearing capacity after external force, such as an earthquake, acts.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the cross-section explanatory view showing the initial process of the construction approach of the foundation laying-under-the-ground base material concerning this invention.

[Drawing 2] It is the cross-section explanatory view of the process performed by continuing at drawing 1 .

[Drawing 3] It is the cross-section explanatory view of the process performed by continuing at drawing 2 .

[Drawing 4] It is the cross-section explanatory view of the process performed by continuing at drawing 3 .

[Drawing 5] It is the important section extract explanatory view of drawing 2 .

[Description of Notations]

10 Foundation Laying-under-the-Ground Base Material

12 Drilling

14 Reinforcing Materials

16 Foundation

18 Grout Material

20 Reinforcement Tubing

22 Reinforcement Rod

24 Reinforcement Steel Pipe

28 Wing Section

32 Wedge

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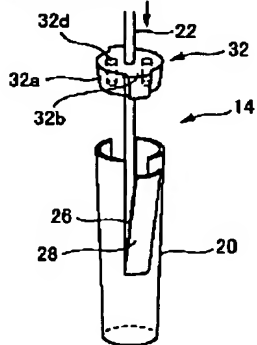
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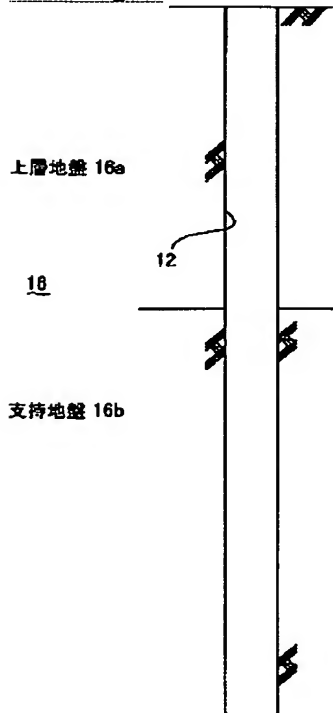
**DRAWINGS**

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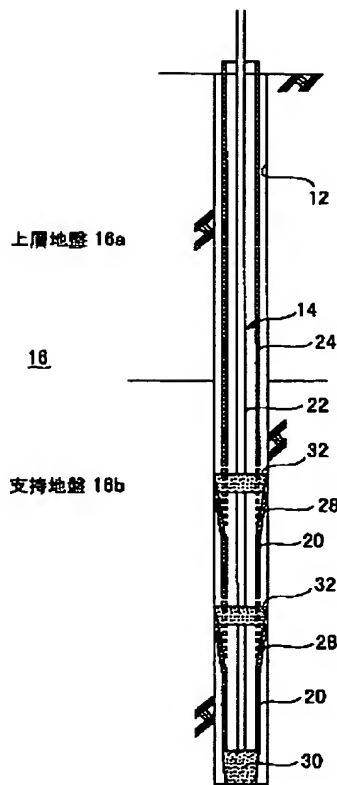
[Drawing 5]



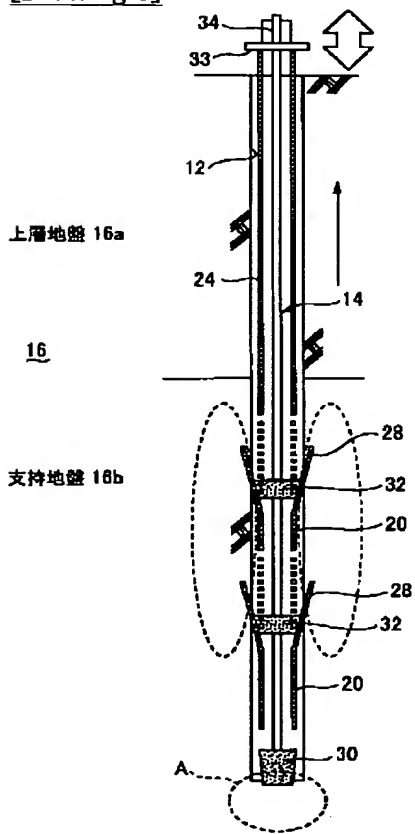
[Drawing 1]



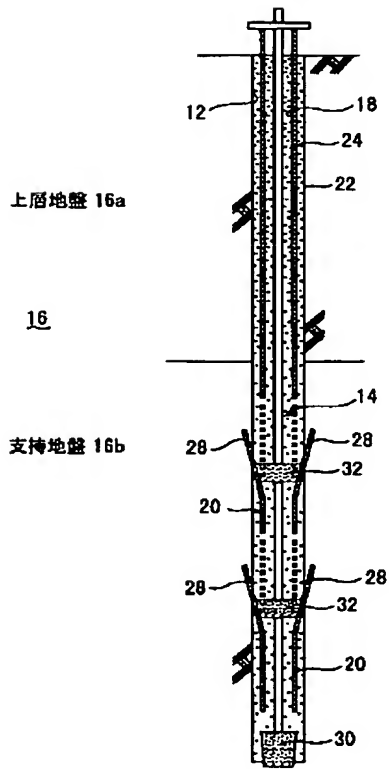
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]